Science Friction

- A Few Common Traits in Science Fiction That May Rub One the Wrong Way

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Ready to go where no hamster has gone before…?

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<u>WARNING: contains spoilers</u>

1. Predator Proper – the least invasive species

I'm currently watching 'The Eternaut', an Argentinian production based on the late 50's comic by Héctor Germán Oesterheld and brought to you by Netflix.[1] All in all not bad so far, at this point still mainly focusing on the various human characters' ways of dealing with Earth being covered by toxic snow. I've reached the episode that features the first alien attack on individuals. Up to this point what I liked most was the ominous arrival of streaks of flames in the sky, created by objects entering the atmosphere. After the attack that concluded the episode I made a mistake. Intrigued by the bulbous shape, I looked up images of the alien invaders. The result were pretty good looks at what appears to be rhinoceros-sized dung beetles with strong legs and some sharp edges.
Here's what I do in such cases.
I hope. And I write my own version in my head. Basically imagine to take over a half-finished script and now scramble to continue in a way that makes half-way sense. An exercise that usually ends in dismay once I watch the rest of it.
'The Eternaut' is not the only example of this very specific problem, others are, for instance, the 'Quiet Place' franchise and 'The Edge of Tomorrow'.[2] You'll certainly be able to think of more, perhaps starting with the original 'The Thing from Another World'.[3] My way of dealing with it offers me a mere two options:
either the invariably butt-naked alien bugs are a vanguard.[4] The real invaders have sent them ahead as a wave to do the dirty work, just like unleashing stouts and rats will wreak havoc on local species populations when such invasive species are being introduced.
Or the bugs aren't linked to conscious invaders, aren't conscious about having been space farers, and haven't in fact come on spaceships, but interstellar rocks that are occasionally flung out of their star system to eventually arrive at another, having somehow survived on those rocks for many generations, which would explain how tough they are and how easily they take what must be a truly foreign atmosphere for them, and are now wreaking havoc among the human population on Earth or one of their colonies, just like, you know, those stouts and rats, but this time as an *inadvertently* introduced invasive species, namely by the unconscious circumstances the universe tends to throw at you. Not an invasion, but an infestation, an intergalactic pest.

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1 El Eternauta (The Eternaut), 2025, written by Bruno Stagnaro & Ariel Staltari, based on the graphic series by Héctor Germán Oesterheld & Francisco Solano López, created and directed by Bruno Stagnaro

2 A Quiet Place, 2018, written by Bryan Woods, Scott Beck & John Krasinski, directed by John Krasinski
The Edge of Tomorrow, 2014, written by Christopher McQuarrie, Jez Butterworth, John-Henry Butterworth, based on the novel 'All You Need Is Kill' by Hiroshi Sakurazaka, directed by Doug Liman

3 The Thing from Another World, 1951, written by Charles Lederer, Howard Hawks & Ben Hecht, based on the novella 'Who Goes There?' by John W. Campbell Jr., directed by Christian Nyby (& allegedly Howard Hawks)

4 Meanwhile I've watched the entire first season of El Eternauta, and it turns out that the writers have been very well aware of the contradiction, already in episode four, following the one after which I'd inspected the 'dung beetles', the character Favalli states, 'I have yet to see the real enemy', elaborating by asking whether the others can imagine those bugs operating a spaceship. And the 'dung beetles' are indeed used as a vanguard by a more intelligent species

Because how else will you explain it? If what has carried them here are in fact spaceships, and if they have built them, then they've got to be really, really, *really* smart. Smart enough to figure out what we so can't, namely interstellar travel. Attributes not normally associated with dung beetles, no matter what their size is. What am I supposed to suspend my disbelief for? Am I supposed to just accept that they're capable of building such a tech and knowing such things, but then they come and not only look like ravenous, predatory dung beetles, but also behave accordingly? Mindlessly killing everyone they see? And using their bodies for that purpose, just like any other predator except one would here on Earth? Any other predator except that one isn't able to build a toy boat from sticks, never to mention an interstellar space ship. Any predator that has worked out the twig-toy boat would be on their way to gardening.
There are plenty of good arguments for why an intellectually and technologically highly advanced civilisation, as compared to ours, and both being required for becoming an interstellar civilisation, would not even dream of laser-zapping other societies in the galaxy, contrary to Stephen Hawking's fears, and even more forward arguments for why they wouldn't have resource- or locality-related incentives for wanting to, more on that later. But even before considering them, the image of the invading aliens capable of all those feats to then behave in no way different than triggered predators, mainly on hungry instincts, it seems, because, after all, they look the part, really doesn't make sense.

I can stretch my imagination some way. I can perforate it, poke holes in it, just to accommodate such glaring logical vacancies in them, because in the end, I can either watch it or drop it, and when it's otherwise halfway decently done I might want to continue watching, in which case I will have to go with it.
But why do I have to?

2. Dr. Lazy and the Multiverse of Self-Indulgence

The story of science and fiction trying to mate and produce an offspring is one of giving and taking. Like all stories, and quite similar to fiction's general take on the multiverse at present, the resulting ideas grow and spread into a great variety of lanes, and, unfortunately, at times fester. There is a right way of doing it, and a wrong one, and the legion of honest mistakes scattered across the landscape on your way.
The utopia of this is symbiotic. While fiction writers keep stressing that they're not in the prediction business where the future is concerned, the expansion of the What If into greater freedom will now and then hit on something that may very well one day come true, or even after some time turn out to

have come true, sometimes in form of a self-fulfilling prophecy: scientists and engineers, who may have been inspired by the scifi of their childhood to become scientists and engineers, picking up on the one or other idea because they recognize it as neat, and making it happen. Other developments will feel as if they'd been bound to happen in retrospect, like that amazing hand-communicator used in the original Star Trek.[5] The principal goods science fiction can sell science, however, are inspiration, warnings, allegories and ethical dilemmas.

The Science Store of Ideas where story writers can supply themselves is much greater. Sheer endless rows of shelves packed with suggestions. In the tech section we have an array of brand new as well as envisioned future technology, complete with implications for discovery, further tech evolution and societal consequences.[6] In the body shops we can pick from countless worlds, all of them unique, many featuring conditions that challenge credulity, each of them a potential scenery, each of them providing questions and scenarios. Entire floors are dedicated to life, in all its shapes and forms here on Earth, as well as speculations about life out there, including life as we don't know it. Species we thought we knew may provide a flurry of ideas. The large Halloween corner is stacked with celestial monsters, with black holes and quasars, pulsars, and the yet speculated family of 'exotic stars', the block of shops next to the pharmacy with genetic ones.
The top floor is reserved for what some call the loony section. Respectively because you might think that what you'll find here is just outright loony, or because it isn't but may result in you being sectioned. It's the floor of the counter-intuitive, the floor of speculation and the interrogation of the really difficult material, the floor of theoretical physics. What you'll find here is the spookiest of the spookiest. Time. The shape and fabric of space. Matter, known and also unknown but persistently indulgent. Non-matter. That which has no mass and is condemned to move at mind-knotting velocity. The smallest of the smallest, so small that they almost aren't, with spaces in between them that are so immense that even the big things almost aren't.

Partly because writers are, contrary to popular image, impatient, and tend to want to try and run away with things, the taking on behalf of the fiction side ever so often ends up dystopian, in the sense that the ideas are thrown in the shopping basket, especially on that top floor, and there with wiping motions, while the instruction manuals are left behind. The results are more usually than not half-baked, and have the authors again and again regress back to humanity's original sin.
These are not honest mistakes, we've all committed those. These are concepts taken without the commitment to grasping their relevant nature, and the scientific clerks are left standing holding their heads – the trade was supposed to be about you spreading awareness about these phenomena, dear writers, and with it thinking. Instead you're planting the wrong perceptions into all those heads. And nowhere is this more obvious with the concept, or rather concepts, of the multiverse.

The multiverse has undergone a boom in the science fiction genre in recent years, not least due to the success of the ever-expanding Marvelverse. It has to be called that by now, because the multiverse has become such an integrate feature in the movies and small screen series that it is largely about that. Loki, Deadpool and others have met countless of versions of themselves and their fellow Marvel heroes and anti-heroes, along with their countless worlds.[7] World versions. Whatever. So that it was only a matter of time and more impatience on behalf of the writers that

5 Star Trek, original series 1964-69, created by Gene Roddenberry

6 NASA spin-offs, 2025:
https://ntts-prod.s3.amazonaws.com/t2p/prod/spinoff/NASA.Spinoff_2025_508.pdf?linkId=746045234
They turn out such a list every year. Read also:
https://www.esa.int/esearch?q=spinoff

7 Loki, 2021, created by Michael Waldron, based on the Marvel comics
Deadpool & Wolverine, 2024, written by Ryan Reynolds, Rhett Reese, Paul Wernick, Zeb Wells & Shawn Lvy, based on the Marvel comics, directed by Shawn Levy

Marvel finally decided to state it as a matter of fact and put a ring on it with ‘Doctor Strange and the Multiverse of Madness’.[8]
Here we witness Strange, in company of and enabled by a young woman with the ability to freely pass through all possible universes, emerging from one world into another, basically the same one/s, but each with minor or major differences as compared to the others, each still more or less recognizable, each with the characters’ doppelgangers displaying their own minor or major differences, just as, presumably, every other individual in those different universes, which already makes you wonder how the global and universal outcomes could be so strikingly similar everywhere (because they are, never mind ‘good’ and ‘bad’ Doctor). Unforgettable the scene in which the Doc speed-passes through a whole line of universes, having him become temporarily pixelized, made of paint, etc.

And it is such a convenient range of possibilities, isn’t it. Virtually everything is possible, and every cul de sac can be broken down. Dead beloved characters can be resurrected, or at least be replaced. And it is a marvellously plain but effective move to explain what we may have thought to be severe goofs until now: the colourful nebulae remain colourful even from close up, resulting in jolly puffs of colourful clouds whenever a spaceship breaks through them (never ceases to leave me in stitches), and space itself is apparently not a vacuum in this universe we now come to realize we’ve been looking at all this time, as the roaring hum of spacecraft and other sounds are conveyed effortlessly.[9]

But let’s not be too hard on the Marvelverse. In the end it’s pure entertainment. It doesn’t protest to be scientifically accurate or even strive for accuracy. Not even to be science fiction. It’s not. It’s adventure stories, it’s action and razzle-dazzle,and there is a definite place for it, just as Star Wars isn’t science fiction, but a blend between adventure-, Western-, and Samurai genres that only happens to be set between the worlds in a galaxy.[10]
Star Trek had from the beginning set itself apart by being predominantly about moral and ethical issues, and optimism in regards to exploration and diversity, while nurturing fundamental discussions about the nature of being, the science-side had been imperfect, but well-meaning and good-humoured, it’s only recently with the new movies that Star Trek has ventured in the same direction as Marvel, leaving all those virtues behind to become pure adventure.

Where it starts to irk is when a production and the authors behind it appear to profess sincerity. From a certain point on every audience is asked to either commit or don’t. If the story is intriguing enough, the dilemmas resulting from the plot engaging enough, the decision may be yes regardless the potential fundamental flaws. A flaw can be devastating, while having to be accepted because without it the story won’t exist.
As such I did watch the whole of the series ‘Dark Matter’, based on a book of the same name, the arguably *laziest* title in the history of scifi (where did dark matter come into this story? It’s never mentioned, it never features, it is in no way connected to the story; admittedly it is catchy, we all know the term, so it may attract readers and watchers).[11] It did manage to keep me. The acting was

8 Doctor Strange and the Multiverse of Madness, 2022, written by Michael Waldron, based on the Marvel comics, directed by Sam Raimi

9 Fluffy nebulae:
Guardians of the Galaxy, 2014, written by James Gunn & Nicole Perlman, based on the Marvel comics, directed by James Gunn
Humming, roaring, whooshing sounds produced by vehicles in space in scifi movies:
you count…

10 Star Wars, aka Star Wars: Episode IV – A New Hope, 1977, written & directed by George Lucas, and follow-ups

11 Dark Matter, 2024, created by Blake Crouch, based on his novel

good, and within the governing concept the events depicted made me want to know how they'd be resolved.
However it is that concept that made me throw my hands up in the air, also because I'd thrown them up numerous times before already. Here we go again. *Sigh*.

If you are a member of the audience sum, and if you have no deeper interest in the ideas and phenomena behind these stories, you'll walk away with the impression that this is what is meant when we're speaking about a multiverse. Because that is how it is portrayed, again and again. After the Marvel-instalment now with 'Dark Matter'. You'll think that the multiverse means that in each of these separate universes, be it neighbouring another like in a big foam of bubbles or on the planes of other dimensions, that in each of them there'll be a version of *you*. Of you, and of everyone you know, and everyone you watch on television. Most importantly of you, though.
Maybe the you in that other universe is happier than you? Maybe they have achieved what you ultimately didn't dare? Maybe they've missed their chance that one fateful day, and unlike you have descended into drug addiction?
With every decision, you're made to think, another timeline, and thus another universe is being created (apparently with an until then identical history?), and the legions of different decisions made by everyone will result in different appearances of those universes, while still remaining more or less recognizable. In one your cities will be more ecologically viable, in others it's utter dystopia. The city, the land, the world as an extension of you, representing all those possibilities as they relate to you and your choices.

While this may serve as a canvas to investigate certain moral issues, the meaning of this take on the real concept of a multiverse boils down to this:
at some point a scifi writer heard the term, looked into it but not very much, and thought, 'multiverse? Must mean *mirror*-verse.'

Because, as Stanisław Lem has his character Snaut famously declare, that's what we all look for in the end.[12] And that's where, if we rather simple-mindedly, arbitrarily and carelessly identify any concept of the multiverse as a mirror-verse, end up regressing to the teased original sin. Ladies and gentlemen, we've arrived back in the realm of solipsism.

I could write a whole book about how frustrating this tendency is, how we currently appear to go through a kind of renaissance of solipsism, how dangerous it is, and what a reliable vehicle by which to remove us further and further from the natural truths that some of us work so much harder to uncover. And why I call it the original sin, how it is the mother of all forms of chauvinism.

The use of the multiverse concept in much of the science fiction tackling it is strong as an example. We find stuck perceptions with quite a number of other concepts, too, and they're often plagued by solipsism as well, but with the multiverse we've reached *all of existence*, no less.
So what has ridden those authors to see 'mirror' when reading or hearing 'multi-', if not an overly eager obsession with *us*, to highlight and dissect our dilemmas, granted, but in a way that makes the entire existence of things revolve around us, and by creating this impression in an audience which should *really* be led away from it?
For there is *nothing* in the original, real conception of a multiverse that would suggest in any way that we could, never mind should, be present in any other universe than this, no matter how many others there might be.
Quite to the contrary.

12 Stanisław Lem, Solaris, 1961, MON (U.S. 1970: Walker), ISBN 0156027607

One of the many take-aways of Lisa Randall's superb book 'Dark Matter and the Dinosaurs' is that the already implausible seeming emergence of life on this planet may appear to be even more implausible, because things had been really darn implausible from the get-go, namely long before there even *was* a region where gas could have collapsed into a G2V type star accreting enough material in its infancy to, semolina-style, have some of it clump and shape to planets by mass-control, with one of those clumps being impacted by a Mars-sized object, resulting in a large moon that helped furthering the conditions, this planet undergoing a succession of varying atmospheres before hosting a great oxygen war, which drew a population of microorganisms for most of its history before, quite recently, resulting in spare sets of cells in organisms and thus providing for an explosion of multicellular beings, all of which have a lot less time left than they think.[13] It had all been already implausible within the time immediately following its own beginning, if it was a beginning, what we commonly refer to as a the Big Bang.
Randall's book anchors the title-giving premise in the basics, giving a tour through the history of the universe according to the best of our present knowledge and assumptions, the nature of asteroid- and comet impacts, what is meant with the term dark matter and why it appears to have been and still is utterly important for the matter-distribution in the universe and thus its fate, and provides a lot of insight into the basics of the science of the large and very, very small.
And what made the already implausible that nevertheless became reality so much more implausible that early on is the yet to be explained imbalance between matter and antimatter. Simply speaking, antimatter are the partner-particles to matter, with the two annihilating another upon contact, releasing a great amount of energy. Both with universal inflation and with fewer 'pairs' of matter and antimatter due to this process of annihilation these instances of annihilation would become ever rarer. But based on every reasoning arising from every model, there should have been a corresponding amount of both matter- and antimatter particles in the young universe. It is a true mystery why matter came to dominate, why there's so much fewer antimatter particles, why not all matter- and antimatter particles have annihilated each other.

This bears on speculations about other universes, the concept of the multiverse, too. For it's not a concept that's been fished out of thin air, or rather the vacuum of space. When observing the cosmos we distinguish between what can be directly observed and what can not but is being inferred – for example a black hole is an object that by its nature and definition we cannot optically *see* (light doesn't escape its gravity, therefore it is not reflected), but which we can infer by the nature of its immediate environment, as well as its wider environment from further afar, i.e. the orbits of stars around it. Dark matter is a variable term for something we cannot yet define, but the reality of which is inferred by its influence. And similarly, there are inferences pointing at the possibility of other universes, either physically neighbouring ours (the foam of bubbles) or being separated in other, yet to be recognized and defined dimensions.

The study of the universe sees us in it primarily because we're the ones conducting the study. Beside that we're one of a myriad of things and phenomena in it, and our existence is confined to a speck of rock, and it's temporary, and, if we don't find a way to spread through this galaxy, it's brief. We don't even know how common any life is throughout the cosmos, we don't know whether it is perhaps rather uncommon, but what we can guess is that, by the looks of it, the universe is much more about motion through time, about objects spinning around others and themselves, and about objects collapsing, exploding or being eaten by other objects, to give rise to more objects, about how weak or strong gravity may be, and about the interactions of particles and the lack of interactions between other particles.

13 Lisa Randall, Dark Matter and the Dinosaurs: The Astounding Interconnectedness of the Universe, 2015, HarperCollins: Ecco Press, ISBN 978-0-06-232847-2 & Penguin Random House, ISBN 9780099593560

Consequently Prof. Randall reminds us that when trying to envision a multiverse, and imagining one of these other universes, we might as well picture it empty. Completely empty, with nothing in it, absolutely nothing. A universe in which what by all virtues of logic should have happened in ours early on has happened, all particles of matter and antimatter annihilating another.
No Doctor Strange made of paint. Nothing.
It may even be possible that the majority of these universes could be empty. That ours is the rare exception. Just as this extraordinary fluff of life's diversity on our planet might be the rare exception – within our own solar system it most definitely is.

Try and walk your way back from a multiverse perhaps mainly consisting of utterly vacant universes to the idea of mirror-verses, the looks and fates of which that are determined by the choices made by this one, briefly existing lifeform.
The amount of contributors to what shapes a world and the life that may evolve on it, chance events that'll be cause to effects that'll themselves be cause to more effects, make it stunningly implausible that the same species will come to exist independently on two different planets, let alone universes. Even just minor differences in chemical conditions have resulted in a staggering diversity of worlds, of planets, moons, dwarf planets and what have you, just within our own solar system, and these exist and further change under the dictate of the same physics. Between universes we might be dealing with altogether differing physics on top of that.

That the concept of the multiverse is really one of a mirror-verse repeated ad nausea in our fiction reflects nothing but our still persisting desire to see ourselves at the centre of the universe – only worse, for now we want to see ourselves at the centre of *all* universes. I'm sure we'll find a way to drive our solipsism to even more insane extents.
And while it may serve to explore certain moral issues, the resulting logic of a storyline insisting on this lazy and self-centred interpretation soon becomes tiresome. In any case, it demands a high degree of suspension of disbelief in those who take the concept more seriously.

3. When, Oh, and Where

While the genre borders of science fiction are diffuse, much of what I'd call scifi not being that in the eye of other, frequently surprised beholders, other examples being readily accepted and called scifi and in my opinion not qualifying, there are definite sub-genres, some of which are being explored here in each of the sections. Time travel is such a sub-genre, even where it is used as a mere tool to provide an altogether different premise, because it is such a decisive and thus demanding factor.
I will not delve into whether time travel is possible or not here, which in principle should always be rephrased to whether the laws of nature allow it even just in theory, and there are plenty of debates one can turn to if interested. In fiction it's a very rich, promising, exciting and mostly blundered opportunity. Endless the questions about changing timelines (and thus potentially creating new universes, oh dear), about the Novikov self-consistency principle, and about all sorts of paradoxes, all of which I will neglect as well, partly because I don't want this to turn into a book, but also because some of the dilemmas, such as whether or not to kill Baby Hitler, seem rather easy to solve in my opinion: you're squeamish about shooting babies in the face? I get it. Why not wait until he's 18?[14]

Endless, too, the ideas people cook up when it comes to vehicle- and apparent function choices, and this is where I feel I have to chime in. Because a few exceptions that create their own problems notwithstanding, they all got it fatefully wrong by neglecting one very basic requirement resulting from one very basic and inescapable fact.
By now we have a great variety of devices by which characters have been enabled to travel backwards and forwards in time, we have the Victorian plush chair with a wheel of fortune in the back, we have a zebra-striped tunnel, we have the Tardis, we have a phone booth that might feel to some like a bit of a knock-off of the Tardis, we have the DeLorean, we have capsules, we have wrist devices, we have contraptions into which you're being shoved or in the midst of which you're standing, to have you emerge full monty in a either very hot or very cold bubble, causing static electricity and, for some reason, a breeze around it.[15] Recently we saw 'the throat' added to this collection, a machine including a bunch of mirrors that appear to open a brightly pulsing gateway into time, and into which you simply have to walk, after observing the admittedly intriguing effect of parts of your body and then yourself multiplying when coming into critical proximity – perhaps once more hinting at multiple timelines.[16]

All square and fair, and we must be respectful of the fact that this growing legion of time travel devices creates the pressure of coming up with yet another completely new thing that must not resemble anything coming before it, lest you want to expose yourself to the accusation of having used it to steal designs in the past. But fine, what matters is the story you come up with, the time travel vehicle is, well, just a vehicle.
Except. Except for that one detail.

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14 Novikov self-consistency principle:
https://en.wikipedia.org/wiki/Novikov_self-consistency_principle

15 H.G. Wells, The Time Machine, 1895, William Heinemann
The Time Tunnel, 1966-67, created by Irwin Allen
Dr. Who, 1963-present, created by Sydney Newman, C. E. Webber & Donald Wilson
Bill & Ted's Excellent Adventure, 1989, written by Chris Matheson & Ed Solomon, directed by Stephen Herek
Back to the Future, 1985, written by Robert Zemeckis & Bob Gale, directed by Robert Zemeckis
The Terminator, 1984, written by James Cameron & Gale Anne Hurd, directed by James Cameron

16 Bodies, 2023, based on the graphic series by Si Spencer, created by Paul Tomalin

Once again I'm asked to do the writers' work for them, once again I'm the audience member filling in the blanks and just presuppose. In case of all these time machines the thing I'm presupposing, forcefully wrenching it into the technical side of the story, is that they all, the chair, the DeLorean, the Tardis, that darn phone booth, they all include an incredibly, unbelievably, *implausibly* accurate navigation system.[17]

For Earth *moves*.

For starters, it spins around itself, creating the institutional conditions we know as night and day, and it does that at around +/- 1700 km/h when measured at the equator. Convert that to where ever you'll place your time-travelling phone booth, and you'll quickly find yourself several yards, if not miles away from where you started after time-travelling for just a few moments.
Add to this that Earth also wobbles.[18] It's not a clean spin, more like the plates you see someone spin on a stick at the circus, so you might find your foot or leg or most of yourself embedded in a wall, the ground, or a nearby phone booth without time travel capability.
And, of course, Earth orbits the sun, at roughly 107 200 km/h. So that with even a very brief time travel without not only a coordination system but indeed a very, very fine-tuned one, you may come out in the midst of a rock deep underground, or quickly and painfully dissolving in Earth's magma even deeper down, or a couple of kilometres above ground, or indeed a couple of million kilometres in the vacuum of space where Earth has left you.

And the answer to these inconveniences seems fairly simple: any engineer nifty enough to invent, design and build a time travelling device will have thought about the problems, engineers love problems, and concluded that among all the requirements the challenge poses the final result will also better be a spaceship.
There, even better than my enforced, contrived, super-accurate coordination system, which I only have to repeatedly employ because the image of H.G. Wells' plush chair in space is so challenging. Give your time machine space capability, tank enough fuel so you can catch up with Earth, factor in everything you need to know about atmospheric entry, descent and landing, and now the only thing you have to worry about is whether anyone spots you in the sky.

Now, it's not that this simple solution has escaped the scifi realm completely, Captain James T. Kirk famously gave the order to convert an already existing spaceship into a time machine in order to scoop up a pair of hunchback whales in the past.[19] The means, however, basically using the sun for a slingshot and let its greater gravity and the resulting acceleration – somehow – do the trick, weren't too convincing.
Velocity might be a factor, as some may feel is suggested, especially since another of the universe's methods to dilate time, as was unfortunately never mentioned in 'Interstellar', is speed.[20] The faster

17 Actually, since Dr. Who is an alien time lord, this may not be all that implausible with the Tardis, after all.

18 https://en.wikipedia.org/wiki/Chandler_wobble

19 Star Trek IV: The Voyage Home, 1986, written by Steve Meerson, Peter Krikes, Nicholas Meyer & Harve Bennett, directed by Leonard Nimoy

20 Interstellar, 2014, written by Jonathan & Christopher Nolan, based on an idea by Lynda Obst & Kip Thorne, directed by Christopher Nolan
While the film can pride itself of having remained mostly scientifically accurate, due to Kip Thorne serving as advisor, if still allowing room for some goofs (***where are my moons, Mr. Nolan?*** *Saturn has a lot of moons, with all those takes on the ship passing Saturn, at least a few of them should have been visible!*), the decision of omitting speed as a cause of time dilation appears to have been conscious (again because of Kip Thorne's involvement we can be sure he'd have explained it to the Nolans). If we respect great speed, especially relativistic speed as a dilating factor, at which the material in the accretion disk around a black hole ends up moving, then, in addition to the extreme gravity and the fact that the ship would have been accelerated to a similar velocity when passing over the disk (ending up as plasma), the ending would have been less optimistic. This can be handled (to cont. next page)

you move, the slower time passes for you relative to another person or thing moving at a different pace, at the end of which you'll arrive at the universal speed limit, the speed of light, where time ceases to pass altogether. This and the tantalizing observations of certain particles misbehaving and seemingly traversing in oblivion to what's proper might lead some authors to suspect the answer may be found in exceeding the speed limit – if time slows down ever more the faster you move, to stop once you've reached the speed of light, what happens if you *could* move even faster? Wouldn't that mean that time will now run backwards for you?
Perhaps, but the reasons why this still wouldn't work for you will be treated in a later section.

In science fiction more examples of 'naturally' occurring phenomena can be found, naturally occurring as per the respective premise, quite frequently involving a Dorothy storm funnel, which is where 'convenient' might translates as 'lazy', since we don't have to bother and explain how the mechanisms behind these phenomena work.[21]
All in all, when it comes to inventing and designing, the time machine that has to be a spaceship seems to me the only viable solution. Any time machine standing on solid Earth ground will ask more from you, at least where the machine itself is concerned, than it gives.

4. Been There, Done That Again

From journeying into past or future it's only a stone's throw to getting trapped in time. And while a time travel that at least satisfies the time traveller might or might not merely be the vehicle to whatever happens in the other period, stories about time loops have time loops exigently at their

(cont. from previous page) ...by viewing this as a perspective-trick: the ship did not really move across the accretion disk, but was still much farther away. Still, the still much accelerated velocity and great gravity would have dilated time *a lot* more for Brand, jr., and old Murph telling Cooper that she's waiting for him would have been a cruel tease.

21 The Wizard of Oz, 1939, written by Noel Langley, Florence Ryerson & Edgar Allan Woolf, based on the children's novel 'The Wonderful Wizard of Oz' by L. Frank Baum

centre. There are a lot of questions to explore, to which the answer coming from many writers once more seems to be to ignore them.
Hence the sins accumulated with the by now impressive number of stories in this particular sub-genre can be rather frustrating for someone who is himself quite fond of thinking about the subject, in periods to the point of obsession, because so many writers clearly haven't obsessed enough. But those sins aren't all repeated every time, which can work as its own trap as one might want to read or watch just to see whether they got it better this time, with the most frequently committed ones making the creator once again guilty of solipsism.

To start with that one, which usually comes as a pack along with the next most used trope, and which better to set the tone than 'Groundhog Day.'[22]
Not to bash that movie, it is very funny, but it does have on its conscience that it really does act as a template for much of what was to come after it, the title even having become proverbial, even though there had been similar stories before it that have established a number of quite dubious rules. For once, only one of the characters notices the loop. In the case of 'Groundhog Day' this is even necessary for all the fun to ensue, and it is tightly connected to the other established feat, kinda, sorta explaining why it is only Phil who notices: the time loop is for him, it's *his* time loop, and it has a purpose, that purpose being to make him a better person, and he eventually manages to become a better person by getting the girl – what could possibly be morally doubtful about that?

To a certain degree it might not even be a bad idea to leave all the intriguing questions that come with such a fantastically privatized time loop, as the audience will debate them after leaving the theatre, such as, if the loop is only for him, does that mean that all the other characters continued normally through time, with those he interacts with in the loop being mere incarnations stuck in time, and how real are they really, or are they indeed their real, original selves, oblivious about their fate until Phil gets his act together? And if that's the case, how far does this reach? Does the loop only affect Punxsutawney, and if so, like what, a bubble, and can it be noticed from outside, or is the whole planet trapped, perhaps even the entire universe? So much trouble for one person, no wonder that Phil at one point exclaims, 'I am a god'.
Besides the topographical issues, the explicit purpose of the loop in this story very clearly and determinedly points at the existence of a deity with an all-seeing eye on Phil, a plan for him, and with his person being a subject of interest for him. In that sense 'Groundhog Day' is almost biblical: the laws of the universe are being suspended so that the course of one person can be set or corrected. Who needs to know about the mechanics of how this is done. It's a miracle, after all, and miracles are ineffable.

But that is not the only way this lack of solutions is making the time loop in 'Groundhog Day' inherently solipsistic, the other, only slightly broader manner is precisely that question of topography and range, for it is a Groundhog *Day*, one single day that is repeated over and over, it's only Phil's bad luck that it happens to be his least favourite day, or rather it probably isn't. Granted, for Phil this is stretched even further by even tailoring the length of the day to him, it basically ends when he goes to sleep, unless he sleeps through the rest of it, and he can always cut it short by just killing himself.
It's become a tradition. The time loop that happens to last for exactly a day before it resets. Why so often a day? Consider what a day is. It's one full rotation of a celestial body, a planet or moon, say. Between those bodies the lengths of the respective days vary, depending on the speed of rotation. On Mars the day is approximately 38 minutes longer than on Earth (*give me 38 extra minutes…*). A Jupiter day lasts less than 10 hours. Venus' atmosphere has so much mass that it slows the planet's rotation, and quite substantially so – a day on Venus lasts a whopping 243 Earth days.[23] If a time

22 Groundhog Day, 1993, written by Danny Rubin & Harold Ramis, directed by Harold Ramis

loop would be depended on the length of day, I'd prefer spending it on Venus, if any time spent on Venus wouldn't be hugely inconvenient for other reasons.[24]
But the answer is of course that the time loop is specifically linked to Earth, because Earth is, apparently, all about us, if a time loop can already just pop up to either create problems for us or force us to deal with other, for the rest of the universe fairly insignificant, problems. In extension, though, it can therefore be assumed that at least the question of locality has been answered, for if it's exactly one day the loop encompasses, the whole of Earth has to be affected. And Phil seems to be a very important person indeed. Again. What could go wrong, especially in the finding some modesty-department.

But as I said, at least the story throws up all these questions. My biggest disappointment film-wise was the Argentinian 1996 production 'Moebius', in which a subway train mysteriously vanishes, with the protagonist gradually suspecting the train to be trapped in a loop.[25] This serves up some suspense for a while, but it all ends in one big, beige Meh once he manages to, well, yes, just hop on it, spending some talking time with the man who'd apparently, somehow, created or discovered the loop, and who's enjoying the view out front, before our hero can just, you've guessed it, hop off again. No questions answered because no questions asked. The film lists no fewer than six (6) writers, and I'm torn between thinking that this explains a lot and wondering how none of the six could have at any point be a little concerned, for instance about having ideas.

The majority of other loop-stories at least manage to get the discussion among readers and viewers going, albeit be it too often so by means of lack of consideration on behalf of the writers and filmmakers. The discussion will therefore be one of enforced critique, and with some of the same tropes making us feel as if we ourselves are being trapped in a loop it can begin to wear out.
Before I end with simply listing the fundamental questions the idea of a time loop invites, there are three more favourable examples of writers at least trying, pushing any post-viewing debate, for they're all movies, into more interesting directions.

First up is the relatively recent limited series 'Bodies'. It's little sin of a rather lazy time-travelling device forgiven by now, the loop it features requires no explanation in physics, because it's a loop entirely created by the conscious choices of one man. It's not a time loop, it's a loop of deliberately engineered consequences, a behavioural loop, a loop of manipulated history, and it could be broken any time if the man responsible for it would only choose to act differently. And he's very much aware of this.
The people of Earth are thus not trapped in time, but live their lives through it as they would anyway, and what they have no idea about are the choices of that man, and the consequences of those choices, not a phenomenon that violates the laws of nature.

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23 https://www.pinterest.com/pin/an-animation-showing-the-rotation-speed-and-axial-tilts-of-the-planets-in-our-solar-system--266064290472038716/

24 If you were to teletransport yourself to the surface of Venus without decent, Venus-appropriate protection, you'd immediately expose yourself to an approximate average surface temperature of 465°C (869°F), with the evaporation process setting in. While you'd enjoy the effects of this, acid rain, that'd be rain not merely containing acid, but primarily made of it, of sulphuric acid, would be coming down on you. The good news is that you wouldn't have to endure any of this for very long, as the rather heavy load of atmospheric mass translates into 92 bars (compared to Earth's 1 bar), flattening you to a pancake while standing. The goddess of love, she's a kinky one.

25 Moebius, 1996, written by Pedro Cristiani, Gabriel Lifschitz, Arturo Onatavia, Natalia Urruty, María Ángeles Mira & Gustavo Mosquera R., based on the short story 'A Subway Named Mobius' by A.J. Deutsch, directed by Gustavo Mosquera

When the – and this is one huge bugger of a spoiler – hitherto arguably most selfish human being possible is eventually himself manipulated into making a different choice, he does so by making it the ultimate sacrifice, causing his entire existence to be erased from the now unadulterated history line, to be remembered by nobody as he has now never existed. Which couldn't be more tragic for a character who's entire motivation was based on the need to be loved.
The series is not without its weak points, but the loop aspect at least makes perfect sense.

'Triangle' has its weaknesses, too, it's unresolved paradoxical issues, but it walks into them with boldness.[26] It's major distinguishing factor is that, while time may be reset, each new round of the loop leaves actual bodies behind. Multiple dead Sally's in a corner on deck of the ocean liner, picked on by hungry seagulls, multiple dead seagulls elsewhere, themselves set upon by hungry crabs, multiple lockets, countable multiple remains, which means that Jess could have, in principle, figured out the number of resets at any given point (although the lockets appear to outnumber the Sallys by far). Unfortunately this only seems to go for a selection of bodies and objects, and has to wonder why there aren't more crashed cars with more Jesses (plural of Jess, anyone?), since it turns out that the loop isn't restricted to the locality of the ship, or indeed more neighbours, more people with every new round – apparently the 'leftovers' must be inanimate, except for one dying Sally, and they're still selective.
As so often, Jess is the only one realizing they're caught in a time loop, but she's the most sensitive in the group, and it's implied by the repeat killings, by her belief that what causes a reset, and thus a return of the capsized yacht, her desired means of escaping the ship and returning to her son, is the moment when everybody's dead. Which at least provides a departure of the cursed one day-rule in favour of a reset caused by an assumed completion of actions and occurrences. And that she's the only one understanding their predicament is explained by her being the first, with the others simply having no time and breathing rest to be given a chance from then on, following Jess' fatal decision, as they're too busy getting killed. Her sensitivity might add to this explanation, as she clearly appears disturbed from the outset, disturbed both by the events that have already been repeated, and which she is forced to forget with every new repeat while clearly being affected, and by her being revealed to be rather unstable as it is.
It is left open whether she has caused the loop. It is left open whether there is a purpose of it, by all appearances there cruelly isn't. The cab driver might only appear knowing to us, like a ferryman carrying Jess to the next round of purgatory. The exact duration of a single repeat is unclear, it does happen during the run of a single day, but does not entail its entirety. It is even unstated where/when exactly the reset occurs. Intuitively the viewer might think it's between the accident and the arrival at the marina, while she's in the cab, in other words, because that's when she loses her memory of the loop, after all. But this memory loss could just as well be the result of the shock she's just experienced, witnessing her son dying, before she, dazed as she is, is being ushered away by the cab driver.
Which, potentially, makes it a perfect loop. One without even a reset. A fraction of time really seamlessly looped, having gone rogue and independent.
'Triangle' does have its issues. But it certainly qualifies for that often used term, thought-provoking.

Undoubtedly my favourite exploration of the theme in a movie is the Spanish 2007 production 'Los Cronocrímenes', 'Timecrimes' in English.[27] Here we have a story that actually makes sense. The only liberty taken is the device resulting in what unfolds, a time machine, and a static, Earth-, in fact room-based capsule, and I've already discussed the problems with that in 3.
Besides that, it's finally a plausible time loop scenario, in which the looping is being created by the main character's insistence on trying to stop the looping. The loop therefore exists due to human

26 Triangle, 2009, written & directed by Christopher Smith

27 Los Cronocrímenes (Timecrimes), 2007, written & directed by Nacho Vigalondo

decision and the acting upon it, having the selves of the character trying to find a way out of the dilemma, and by that consistently establishing the loop. It's a perfect marriage between the logic of paradox and the Novikov self-consistency principle, and the result is to equal parts spooky, unsettling and entertaining.

So here a small bunch of questions I wish future time loop stories would respect.

Duration

How long between resets?
If you choose it to be 24 hours be aware that you're making a statement, one that has the loop involve the entire globe, and it'll either be connected to something inherent about Earth (its electromagnetic field?), or about the beings on it being somehow special in the cosmic context, which will make it a religious loop.
There's no reason why a loop shouldn't be shorter or longer than that. No reason why a loop shouldn't last weeks, months, years, decades. Centuries. There are proponents of what's known as The Big Crunch, with the universe expanding to a finite extent, to then collapse back into the condensed spot it began as, essentially pulsating over a long time. There's no real evidence for this idea, but if we were to entertain it we'd end up with the whole of existence being contained in a time loop. Granted, may be difficult to get some drama out of it that fits into a two hour movie.

It's okay to be ambiguous about duration. A 'pure' loop, so to speak, might not have a reset, but consists of a self-contained chunk of time looping seamlessly. Cause and effect may set the loop's limit, the reason for the loop to come into existence being its own cause, for instance.[28]

Location, Topography

What is affected?
Is it just the town you're in, is it the country, is it the whole planet? The solar system, the galaxy? Or is it affecting the entirety of the universe? This is essential, because if you want it to happen only to/in Punxsutawney the question will be, well, what's going on outside town limits? Are time loops bubbles that sit around in the landscape for people to occasionally stumble into? The same goes for any surface area that's part of body moving through the vacuum of space. Frankly, the more logical solution would thus be the planet to be affected as a whole, at least.
Both this solution and the universal one is, of course, quite a fatalistic one. The protagonists would be challenged to solve a problem on behalf of the entire world, even universe. Naturally, this depends largely on cause.

An alternative in thinking would be that it doesn't affect a location so much, but a person or persons. This, too, would lead us to speculations about cause, and it's a somewhat ethereal idea. Perhaps another, somewhat contrived solution would have to do with speed, something that has you move incredibly fast, and, maybe in cooperation with some other phenomenon, not merely slowing down time for you, but resulting in a loop, while keeping your experience out of the experience of others, locality-wise. Essential this would be an experience in another, created dimension. Perhaps the closest to actual theoretical physics would be making use of proposed closed timelike

28 https://en.wikipedia.org/wiki/Temporal_paradox

curves.[29]This wouldn't absolve you from questions about locality and topography, although there have been suggestions that those could form at the mouth of a wormhole.[30]

Cause

How and why is the time loop created?
In many time loop stories it is suggested that the loop has something to do with one or more characters experiencing it. From making Phil a better person to a second chance turning a million new chances to get something right to plain old punishment for being a bad person. That's the solipsistic take, and it infers some version of a god. Of a conscious purpose behind the whole event. 'The world is out of joint…', that sort of thing.[31] If that's your choice then there's little else to add. You know. Ineffable. Which is a weakness in the narrative. Not much to discuss afterwards.

The personalized loop might work if the affected person or group have inadvertently done something very wrong while tinkering with the laws of the universe. It's a favourite in the whole genre. However, that would probably result in more than this group and their location being affected, and it's only because of a subjective narrative that we don't learn about the rest.

Having the whole universe get out of joint in this manner is certainly the spookiest choice. Time itself is real spooky to begin with. It is also the most convincing variation, because time is an aspect of physics, and anything affecting it this drastically has to be a natural phenomenon.
Constricting it locally only works under the right conditions, and it may involve gravity. After all, there are conditions under which time is massively affected, most notoriously in close vicinity of black holes.
Warning: it'll cast you in a whole new rabbit hole should you pick a black hole as the cause for a time loop. Your protagonist would experience an entire theme park of accompanying phenomena, as would the environment he's whiling in.
The same would go for any other cause that is locally restrictive, as the involved effects would surely be noticeable if the cause was to be sought in curving spacetime.

The How is a more intriguing question than the Why, because it's a somewhat weary game to search for purpose in nature, but cause and effect have a good track record.

Awareness

How come your protagonist even notices?
If we choose not to define a cause that would present itself with all sorts of distracting effects, we would still want a loop that affects everything within the frame of experience we've picked. But everything really means everything.
What enables our brain to electrically and chemically form a correspondence with our environment and reflects on this experience, including by means of words, is still part of the universe. Even something as elusive as thought is. A plausible conclusion is that if everything around you is affected by a time loop, you are, and you being you as a whole entity, including your brain activity

29 https://en.wikipedia.org/wiki/Closed_timelike_curve

30 Kip Thorne, Black Holes & Time Warps: Einstein's Outrageous Legacy, 1994, W. W. Norton & Company, ISBN 0-393-31276-3
Kip Thorne, The Science of Interstellar, 2014, W. W. Norton & Company, ISBN 978-0393351378

31 William Shakespeare, The Tragedy of Hamlet, Prince of Denmark, Act I, Scene 5, between 1599 and 1601

and thus your thoughts, and you might never be able to notice that you're in a loop, because you'll keep having the same thoughts over and over, accompanied by the same emotions. Don't we all know the feeling, anyway.
Doesn't do well for drama in a story, we need someone within it to notice, otherwise all we'll do is watching a bunch of people endlessly performing the same actions, and that can quickly become tiresome.
The way out is to decide that what we call so nonchalantly the mind is in fact not necessarily condemned not to notice (even though that means that its owner will be condemned to be or become aware of this Sisyphus existence), that at some point it'll become suspicious. If we imagine it, it'd be a sensation of déjà vu first heralding a growing awareness of there being something really wrong.

The next question is then why it would be only one person, if it's only one. We know the answer where Phil is concerned, it's *his* loop, the loop is for *him*. In 'Triangle' the question doesn't really come up, because the rest of the group does become aware that things are weird, but are subsequently too busy getting killed one by one, for every loop rotation. That Jess is the first needn't be troubling, someone will be quicker than others with connecting the dots. Which already writes the next pages, the having to convince the others-part of the script.
But in 'Triangle', too, the only ones being confronted with the reality of the loop are the members of the jolly yachting party, even though we later see conclusive evidence for the loop affecting more than just a patch of ocean or a cruise liner. Everyone else is blissfully ignorant. Granted, they haven't been in a ballroom where the food is fresh one moment and rotten next time they enter.

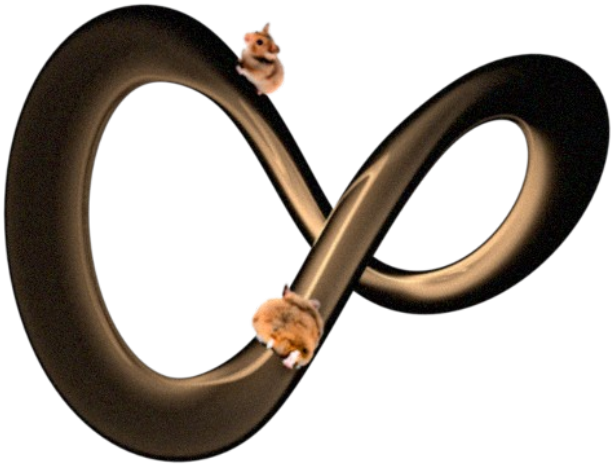
Imagine a story in which an entire city becomes gradually aware they're being trapped in a time loop. Then the entire country. Finally the whole planet.
The having to convince-aspect is the answer. Just like Mulder isn't the first one to notice in the 'X-Files' episode 'Monday', but has to be convinced, round by round, by the one woman who has already noticed, his task now being to convince Scully.[32] Unfortunately, pardon me, fortunately for them the spell's broken before the whole city has to be convinced.

There is also a possible psychological angle by which to make a time loop story more ambiguous. I've found a case study detailing a young man experiencing what it calls persistent psychogenic déjà vu, not linked to neurological abnormalities such as temporal lobe epilepsy or dementia.[33] He experienced an extreme daily amount of déjà vu, which he described as making him feel as if trapped in a time loop. He was fully aware that his problem was of a medical nature, but try to imagine how it would be for someone who wasn't. It'd open up to a story in which the reader/audience isn't sure whether it's a medical affliction or indeed a time loop.
I tried that one with an own story (six tries, still not 100% satisfied).[34] If you'll forgive the plug.

32 The X-Files, Season 6, Episode 14, 'Monday', 1999, written by Vince Gilligan & John Shiban, directed by Kim Manners

33 Wells et al - Persistent psychogenic déjà vu: a case report: https://pmc.ncbi.nlm.nih.gov/articles/PMC4295571/pdf/13256_2014_Article_3015.pdf

34 D.C. Ceva, A Cauchy Plane: https://archive.org/details/a-cauchy-plane
I should add that I didn't base the story on the case report above, coming across it while researching for the story, and getting enthusiastic over how well it fit for my purposes, while wanting to keep it more ambiguous.



5. Speed Limit

How fast can you go?
Depending on who *you* are, up to 300 000 km/s (299,792,458 metres/s). But that's it. That's the speed limit. That's the speed of light. And, having considered time issues before, that's the point when time slows to a halt for you, relative to slower moving objects and beings. Which is thus a related issue: it would appear that you can't move beyond the point where time slows to ceasing, as if by a fail-safe guard.
Consequently there's no such thing as faster than light travel, even though way more than enough science fiction stories have implied ships that master the distances between the stars that way.

Spaceships won't get anywhere near that speed, though. It's reserved for the entities that *have* to: particles without mass. The requirement for speed of light travel is that you have no mass, and this quality simultaneously compels you to travel at that speed. *You* would therefore have to be a massless particle. I don't know about you, but with travelling at the speed of light it's the same for me as with that idea of an afterlife as 'energy' – I fear I won't feel quite the same as a bunch of separate particles.

The spaceship and everyone in it won't make it there. Disintegration begins before that. Velocities very close to it are called relativistic, and for witnessing the accompanying phenomena one could observe if one would manage to get that fast, one has to resign experiencing them as plasma, with the electrons ripped away from one's atom cores, while getting very, very hot. Even way below those speeds it's not really feasible, because ironically, while the only things that can travel at the speed of life have no mass, below anything approaching relativistic speed the gaining of speed means putting on more mass, which means you'll have to compensate by expending more energy.

So simply going ever faster in order to manage interstellar distances isn't the answer. It'll help shorten the trip somewhat, but there's a limit, and the journey will still take much longer than what's acceptable for more than one generation to while away with a deck of cards.
Generation ships are hence one of the answers people came up with, vessels, preferably large, that carry a population in the direction of another star, living out their lives onboard this vessel while, importantly, reproducing, and so forth, each generation essentially living and reproducing for the one that'll eventually reach that star, and a, hopefully, habitable planet.

If you've read some of the stories set onboard a generation ship you'll know it won't be that easy, even without having to introduce a contrived conflict.[35] Beside it being a real bugger if the final crew's ancestors somehow misinterpreted the signature of the target planet, the first problem with a generation ship would be that while the initial generation, the one leaving Earth, would (hopefully) consist of volunteers, already with the very next generation this would so not be the case.
The only answer here would be to make it a super-cool and -comfortable vessel, real large, with lots of entertainment, a mobile, steerable world to which few others will compare favourably, with weekly lectures showing just how rotten the original home planet had become. Even then there'd most probably myths evolving, and with them discontent, not to mention perhaps jealousy about the future of that arrival generation.
The issues would be mostly social ones, but they may turn out to be mighty.

Another idea would be to just put the travellers to sleep. Not only to save them the boredom, but to extent their lives, perhaps indefinitely, so the original travellers are indeed the ones reaching the other star system.
In principle there's not much to object here, other than we'd have to talk a yet truly unknown technology here, because cold alone won't do the trick. 'Just put'em on ice.' Excuse me, what do you think I am, a chunk of ham? Those alive today who indeed count on cryo-preservation are at best impatient. Lowering your temperature below freezing for any lengthy amount of time, by everything that's possible today, and it would be a long time, will have you emerge either dead or brain dead or a lemon. The effects of frost and, you know, death on the human body won't change, so it can't be freezing alone. But granted, we don't know what the future holds, so by all means. Just don't wake up early.[36]

Speaking of impatience, some of the above solutions won't provide the satisfaction of a whooshing spacecraft, even though they'd still include one that's moving as fast as possible. Aware of the problems that exclude the speed of light or even faster than light travel (also see 3.), some writers and filmmakers resort to simply renaming whooshing speed, without further explanation, or make the whooshing speed something other than light speed, also without much further information, and it's almost its own genre within the sub-genre of the genre: the fabled, fabulous *hyper speed*.
It might not always be called that, in Star Wars it is, but there are other stories in which something like it is employed, where 'something like it' means something undefined. Push the lever, the stars before you begin to stretch, and whoosh.
Perhaps what's intended is something like in Star Trek, where the naming at least entails an implication. The Warp Drive implies, perhaps even indicates, the warping of space(time). An idea we'll swiftly get to, but what it really implies, if taken verbatim, is not so much speed but opening a passage, a wormhole, that is, through which to travel to one's destination. The Enterprise and other star fleet vessels still appear to need doing that at high velocities, and the first ride enabling 'warp speed', and hence the name, clearly shows the intrepid inventor as having to gain a certain velocity first.[37]

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35 A few examples of Generation Ship scifi to recommend would be:
Robert A. Heinlein, Orphans of the Sky, 1963, Victor Gollancz Ltd., ISBN 9780671318451; first published as the novellae 'Universe' and 'Common Sense' in Astounding Science Fiction, 1941
Kim Stanley Robinson, Aurora, 2015, Orbit, ISBN 9780316098106
Brian Aldiss, Non-Stop, 1958, Faber and Faber
We have another sub-genre here, and a rather comprehensive list of treatments can be found here:
https://sciencefictionruminations.com/sci-fi-article-index/list-of-generation-ship-novels-and-short-stories/

36 Passengers, 2016, written by Jon Spaihts, directed by Morten Tyldum

37 Star Trek: First Contact, 1996, written by Brannon Braga & Ronald D. Moore, directed by Jonathan Frakes

Not quite sure why. The challenge of wormholes is all about energy. Once you know how to open one and keep it open long enough you don't need to be super-fast to pass it. You just go in. And out again, where ever it'll be.
Wormholes are what probably provides the most plausible option when it comes to having to bridge interstellar distances. Nature doesn't forbid them. They might not occur in nature (though, then again, they might, but only very briefly, and being very tiny), but neither does plutonium, for all we know. That challenge, to create enough energy to bend space enough to create a short cut, essentially by folding two locations on another, and, importantly, to keep it open for long enough so something can pass through, is a mighty one, and we're not even close to understanding if and how it'd be possible to generate such energy. But perhaps, in the far future, if we allow ourselves the time to survive, as well as recover from the path of regression we're currently on, perhaps one day we'll figure it out.

Star Trek's warp drive-driven ships, and much more pronounced the Endurance in 'Interstellar' appear to lead the travellers through what's known as the Bulk, a region (for lack of another word) outside our spacetime they're passing on the way from one spot to another, far away one. In 'Contact', both the novel and the movie, it's an actual artificial system of tunnels connecting the locations, but would amount to the same bulk-passing.[38]
The reality of passing through a wormhole would probably look a lot less dramatic, although I don't want to miss what's one of the coolest looking moments in 'Interstellar'. And while the spherical wormhole mouth is arguably the closest to being realistic (allowing the word for something hypothetical), it'd be a lot more economic to only open it for each transfer instead of keeping it to hover about. An even more realistic depiction of the whole process would have the wormhole mouth be generated only momentarily, for just enough time needed for a spacecraft to enter, bulging out, perhaps its gravity pulling the ship in, and then closing, disappearing the moment that's done. The transition itself, the passing, should take no time at all. You're going in, you're already out again, at your destination.
Again, for once I prefer the visuals of passing the bulk in 'Interstellar'. Looks awesome.

In summation, a wormhole provides the narratively most viable solution to the problem of interstellar travel, and because wormholes are theoretically possible it's not a purely convenient one. There are variations on the theme, I still haven't read the 'Foundation'-series, shame on me, and only watched the 1st season of the dramatisation so far, but it would appear they're using a travel means that has a spacecraft generate a black hole, presumably providing the energy and gravity needed to fold space (?), which essentially comes down to the same principle – the black hole not as something to venture *into*, but as a means to generate the energy needed to open a wormhole, if that's how it works.[39] My knee-jerk reaction to creating a black hole inside or besides a spaceship was still, 'don't do that.'
Ideas involving any other 'inter-dimensional transition' are by default vague, and appear to me as siblings to the wormhole principle, so why not going the more plausible way to begin with. I haven't mentioned the Dune series up to this point, because, frankly, I don't quite grasp the mechanics involving the spice and a performed interstellar transition, the spice being relevant for enabling interstellar navigation, but if memory serves the actual technical side of managing these distances isn't explained.[40]

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38 Carl Sagan, Contact, 1985, Simon and Schuster, ISBN 0-671-43400-4

39 Foundation, 2021-2025, created by David S. Goyer & Josh Friedman, based on the Foundation series by Isaac Asimov, 1951-93, Gnome Press, Spectra, Doubleday

40 Frank Herbert, Dune, 1963-65 (serialised), 1965, Chilton Books
Dune: Part One, 2021, written by Jon Spaihts, Denis Villeneuve & Eric Roth, based on Frank Herbert's novel, directed by Denis Villeneuve

Anything that has interstellar travel depend on simply going ever faster is frankly not realistic, and at some point we should be past this idea.

6. They're Here

Somebody conduct a count, please. According to my own impression, the amount of stories in which alien visitors are coming to invade, pillage and exterminate seem to outnumber those featuring aliens with peaceful intentions *by far*.
We like to say that the better scifi reflects on known issues counting in the present, meaning it reflects on *us*, and this may be the case here, too, but the real fear of a technologically much more advanced civilisation learning about our whereabouts and coming to invade, perhaps exterminate us, has been driven to a worrying extent, in that it has made its way into the thinking of some of the most prominent physicists, feeding it the more.[41]
I've written a 51-page longform about my objection to this take, so here just the briefest calibration.[42]

First the stage has to be set. What's the premise here? The premise requires an alien species of advanced intelligence and technology to come here, to physically arrive at Earth, either in alien persons, or as represented by their robotic extensions. They have to be advanced in both, their intelligence and technology, because they have mastered interstellar travel, something about which we don't even know whether it's possible, and they've done so in a feasible way; the conventional method of flying as fast as possible by means of generation ships would have their own kind not so much wonder who they are upon their return, but in fact *what* they are.

Now, the worry of even some highly esteemed physicists is that this scenario would be followed by a repeat of what we've seen here on Earth between tribes and nations throughout history: a technologically more advanced society taking over a less advanced one, enslaving its people, or

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Dune: Part Two, 2024, written by Denis Villeneuve & Jon Spaihts, based on Frank Herbert's novel, directed by Denis Villeneuve

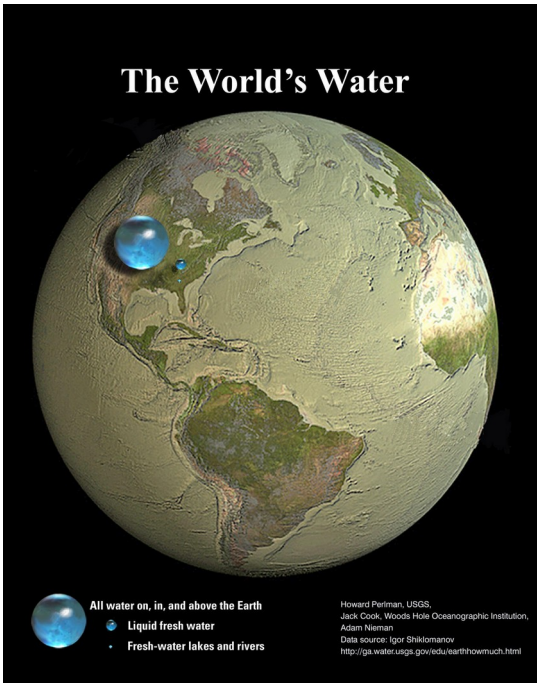
41 Stephen Hawking has prominently voiced this warning numerous times:
http://news.bbc.co.uk/2/hi/8642558.stm
Others physicists have picked up on it.

42 D.C. Ceva, Don't Be Afraid, Don't Be Very Afraid:
https://archive.org/details/dont-be-afraid.-dont-be-very-afraid

even wiping them out. Because this has happened again and again between us, it's reason enough for those worrying about letting potential other civilisations out there know about our whereabouts to extrapolate this behaviour to this hypothetical scenario of aliens coming here.

When we look at our violent history of this principle in action, we still have to ask about incentives. Why would the technologically, better armed society want to assault the weaker one in the first place?
While the principal core of this behaviour is no doubt rooted in chauvinism, a self-perception of being better, more important, more worthy that in the eyes of the chauvinistic assailants permits them to commit genocide, or even where they might be aware that it doesn't allows them to do it anyway, and while on an individual level pure joy to destroy and inflict harm, sadism, will frequently play a part, the venture of war itself is expensive and economically risky unless there is a profit to be gained, be it material or one of strategic advantage and security. The motivation might have slightly shifted in recent decades, but expansionist wars have retained their regressive character to this day. Historically the incentives would have been imperialistic, divided into the desire of land to expand a kingdom, to exploit the resources on this land, and to gain strategic and political advantage.

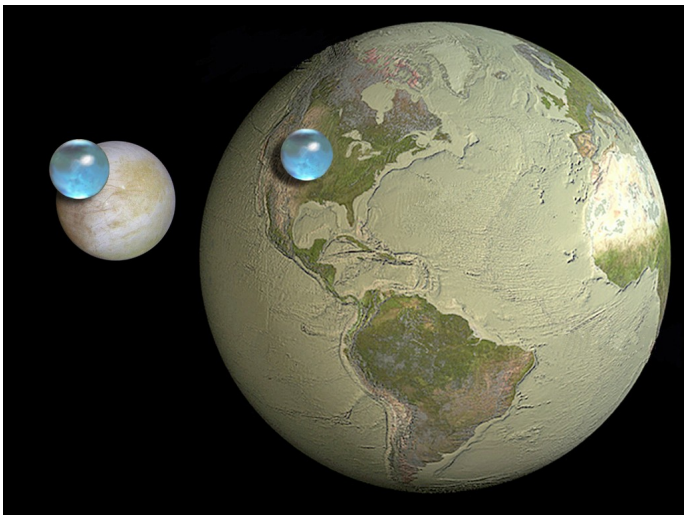
Let's follow those who're worried about alien warriors and extrapolate these incentives. Which could it be for a space-faring society of aliens?
I propose we begin with resources, and pick one that the aliens may really want. The harvesting of resources was, if I remember correctly, the incentive of the evil aliens in 'Independence Day', and it's the implied reason for the Martian attack in 'War of the Worlds' - '...and regarded this earth with envious eyes'.[43]
Let's make it water. Surely one of the most precious resources there are, this wonderful liquid (when in its liquid matter state), one of the main ingredients to life as we know it, and needed to sustain it, and so many others things you can do with it. And we do have a lot of it. Our wide, deep oceans, or many rivers and lakes, ponds, canals and creeks, it's collected in our supply system, it comes down raining from the clouds.
Only, if you show it as its total amount next to a dried out Earth, you'll get this:



43 H.G. Wells, The War of the Worlds, 1898, William Heinemann

Suddenly it doesn't appear like that much after all. Earth has a circumference of about 40 075 km at the equator, it has a diameter of 12 756 km at the equator (our planet is not a perfect sphere but bulges at the equator), with a crust that is at its maximum a mere 70 km thick, at its minimum only 5. All the bodies mentioned above are on the surface of this crust. This amounts to approximately 1,386,000,000 cubic kilometres of water. A lot when you have it before you, not so much when compressed into a bubble and shown in context as in the the picture above.

In contrast, the water under the icy crust of Jupiter's moon Europa, likely a global subsurface ocean, is believed to be made of more water than we have here on Earth:



WATER ON EUROPA VS. WATER ON EARTH Europa's oceans may host upwards of twice the amount of liquid water found on the Earth. *Kevin Hand (JPL/Caltech), Jack Cook (Woods Hole Oceanographic Institution), Howard Perlman (USGS)*

image source: The Planetary Society

This large body of water is produced by both the moon's mother planet Jupiter as well as its sibling moons, Ganymede, Callisto and Io, gravitationally stretching and releasing it, a tidal massage, heating its interior, and because Europa is largely made of ice, melting that ice.
Both Callisto and Ganymede are also ice moons, and would undergo the same mechanics, we're pretty sure that at least Ganymede does, thus also harbouring huge amounts of water beneath its crust. Ganymede is the largest moon in our solar system, bigger than the planet Mercury.

A few clicks farther out, at Saturn, there are still more icy moons. Enceladus is a small moon, you can put it down on Wales. But it, too, features a subsurface ocean, and it is being helpful in that it spews out some of this water through cracks in its crust as vapour, which has been analysed by the Cassini space probe – less saline than our oceans, and containing all the ingredients needed for simple life to evolve.[44]
Titan, the solar system's second largest moon, also still larger than Mercury, is interesting for a high number of reasons, among them yet another suspected subsurface water ocean. Mimas may have one as well, though opinions are still divided about that one.

44 https://science.nasa.gov/mission/cassini/

Still farther out, there is the moon Triton, likely a capture, a former trans-Neptunian object quite like Pluto, and rather similar to it, although larger, now degraded to being Neptune's largest moon, and by now we're pretty sure about Triton also featuring subsurface water bodies.

Clearly, subsurface water in large quantities, including quantities exceeding what we have here on Earth, are rather fashionable in our solar system. But are they in other star systems, too?
Very likely. While conditions between the celestial bodies vary, producing different environments, the underlying physics are the same, the decisive set of circumstances here being the tidal massaging of icy bodies. We have discovered thousands upon thousands of exoplanets orbiting stars other than our own, planets are a normal outcome of star formation, and so are moons orbiting those planets. Depending on original material and distance from a star, there will be plenty of icy moons in other systems, too, following the same principles.

That the conditions in other systems aren't so different from ours is also suggested when one of it objects is being hurled our way. At the time of writing this we're currently welcoming the 3rd interstellar object that we've been able to observe crossing path with the plane of our solar system. Two of them, including this one, being comets.[45] By all accounts quite ordinary comets, just like ours. And comets are a water source, too, being largely comprised of ice and dust. There are hypotheses that much of Earth's water, perhaps even all of it, had been delivered by comet impacts during the early stages of our system's history.

And that's still not all.
Here's a pretty picture of the Rosette nebula, using wavelengths that have us see the elements it is made of glow in different colours:

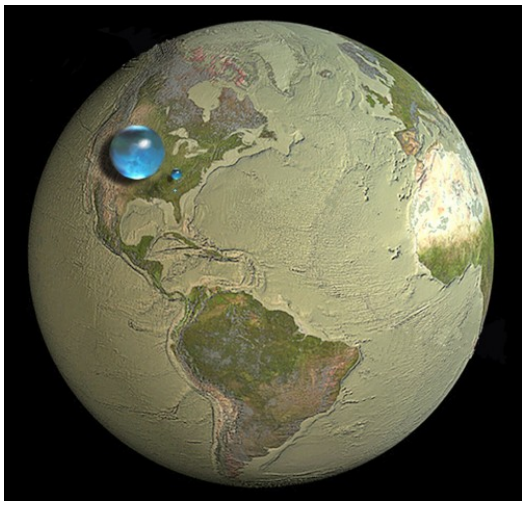
There's the universe's most abundant element, hydrogen, in reddish hues, you've got your sulphur in yellow, you've got your oxygen in blue…
What is water, chemically speaking? Two hydrogen atoms and one oxygen atom for a molecule: H_2O. Hydrogen in red, oxygen in blue, and from left to right on this picture it's about 65 light years. One light year measures 9.46 *trillion* km.

We take these building blocks of water in the many, many nebulae containing them, the water-carrying comets, all those icy, massaged moons and their subsurface oceans orbiting exoplanets as well as those we find nearby in our system, we add all the water we have here on Earth, and we'll end up with what is known in scientific circles as Some Water.

What was our premise again? The alien invaders having to come here, thereby demonstrating their intellectual and technological substantial advantage over us since they've clearly figured out how to traverse the gulf of space between the stars, and feasibly so.

45 https://en.wikipedia.org/wiki/3I/ATLAS

So.
You tell me.
How likely is it that a species could be this intellectually and technologically advanced, but it has *somehow* escaped them that there's all this water all over the place?
And if it hasn't, how likely is it that they're this smart and advanced, know about all those water sources, and yet they still come for *this puddle?*



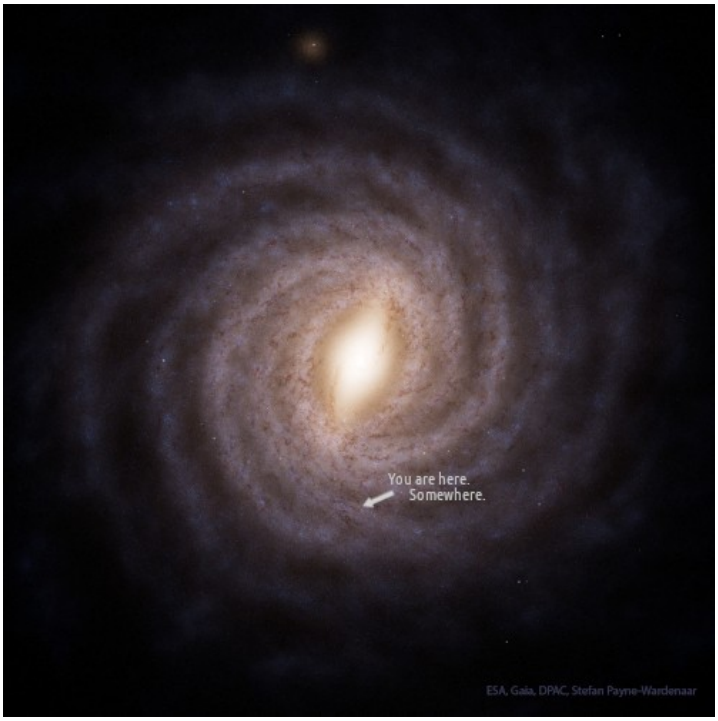
I concur. Not very likely.

And what goes for water goes for every other potential resource to be found on our little planet. Fossil fuel sources, for, you know, their sputtering steampunk flying saucers? Check. What we call rare Earth minerals? Can be plucked from your next best asteroid. *We* have made the first planning steps that may one day lead to asteroid mining. Solar power? Please. Wait for nightfall, count the stars. Maybe the alien invaders are more conquistador-like, out for gold? Many supernovae individually produce more gold than there is, ever has been and ever will be on Earth. Diamonds? Everybody seems to like diamonds. Drag a big net with heavy weights through Jupiter's atmosphere, at some depth the pressure of this atmosphere temporarily squeezes its carbon compounds into diamonds, and it literally *rains* those things. The same is suspected to happen deep in Uranus' and Neptune's atmosphere. Even produces that won't come into being by themselves, such as plutonium – you think a species like that would have a problem creating it where we've already managed? More likely they'd ask us why we're still producing this very dirty and dangerous stuff.

How about the resource of labour, I hear you asking. Isn't the premise of some scifi stories the enslavement of the human race? Besides the ethical issue, and we're getting to that question later, if you view it with the coldest blood, using humans, or any other species for that matter, as unpaid labour is actually quite an expensive type of resource in itself. You'll have to feed the enslaved humans, give them drink, prevent outbreaks of diseases, provide at least the most basic living conditions. And taking and keeping slaves is not only ethically an asshole behaviour, for such highly advanced aliens it would be totally unnecessary. In our time there are quite a few people worried about their jobs and them in it being replaced by robotics and by AI, and to a degree this has already begun and progressed. If *we* can build smart robots and a basic AI not yet quite worthy the name, rest assured, so can a technologically much more advanced species. Build robots to do the heavy lifting, don't make them too smart and too empathetic to avoid them actually feeling the pain of injustice, and you'll be good. All the remaining costs are manufacture and maintenance.

So I think we can confidently strike resources from the list of potential incentives for an invasion.

Likewise real estate.
Both in the sense of strategic advantage as well as living habitat. Regarding the former, ask yourself. Do you know where you are?



As for living space to be conquered, if you only look at those bodies in our solar system that have mass enough to have shaped themselves to a sphere, all those planets, dwarf planets and moons (Saturn alone has over 270 moons, though most of them are small and not spherical), one striking fact is just how *different* they all are. Minor factors during their formation have resulted in huge differences. Three of the four larger planets of Jupiter, Ganymede, Callisto and Europa may all be ice moons, yet they still differ from another, with Ganymede even having its own magnetic field. And the fourth, Io, is not icy at all, it's the volcanically most active region in the solar system, featuring over 400 active volcanoes.
Titan has a thick atmosphere. And lakes. Lakes made of a liquid methane- and ethane blend (should we learn to behave and one day have lunar tourism, on Titan smoking will be strictly prohibited).
Pluto has mountains, up to well over 2 km high, and they're made of ice.
Other star systems own planets and moons that go straight into the bizarre. There's a planet covered with a layer of *metal clouds*.[46]

By and by we learn just how implausible the evolution of life was here on Earth, how many factors had to come to work in combination, from Earth's distance to the sun, a distance that may have changed, and a star that had radiated much more weakly in its infancy, to the right mixture of gases in its eventual atmosphere, an atmosphere that had been an entirely different one during the planet's beginning and that has changed several times since, making it essentially a different planet, with just the right conditions for the first simple life to emerge, conditions that had been different back then, resulting in first simple beings we'd now call extremophiles, to a great oxygen war with the

46 LTT 9779b: https://www.esa.int/Science_Exploration/Space_Science/Cheops/Cheops_shows_scorching_exoplanet_acts_like_a_mirror

arrival of simple beings taking advantage of sunlight to convert it into sugar, over the longest periods of only simple organisms, mostly unicellular, existing until, somehow, and quite late in the game, multicellular life began its reign, the Cambrian explosion occurred, resulting into this baffling lushness of diversity of for us visible lifeforms, and we now understand that the presence of a large moon such as ours played a vital part in all this, a moon that is only there because early on, when both bodies had still been hot and mushy, a Mars-size object collided with Earth.
So many factors and variables, so many changes, resulting in a unique world, just as how it went for all the other worlds. In case of Earth, a truly unique one, so far we haven't spotted anything like it.

The chances that another, alien civilisation would have evolved under the exact same series of changing circumstances, which would be required if they'd have the exact same biological needs that would make, for instance, our air familiar and attractive to them, that would make Earth the paradise for them that it is for us, that would make it even habitable for them, these chances are infinitesimally tiny. The worlds in our immediate neighbourhood, the solar system, also vary in the many ways they're hostile to us.

But in a statistical twist, even if coincidences would collaborate in such an astounding way as to result in a species that has evolved in a different star system under the exact same environmental circumstances and thus having the exact same requirements, even more implausible than there being more than one world with the exact same environment causing the exact same biological requirements would be that there'd be *only* two.
No need to go laser-zapping the locals.

If your objection would now be that the aliens, highly advanced relative to us as they are, could easily terraform (whatever the more appropriate replacement term for 'terra-' would be) Earth, as witnessed by Tom Cruise, sure.[47] Terraforming other worlds would be a huge challenge for us now, for them it may be what they learn in kindergarten. But in that case they could do it with any other half-way suitable world. Many hundred billions to pick from.

Suffice to say, we can also strike real estate from the list of potential incentives with good conscience.
Not much else left, is there. At this point Tim Burton's Martian hooligans make more sense than any serious, more conventional because incentive-driven invaders.[48]
How likely are interstellar hooligans?

This is part two, the question about chauvinism. Do aliens have morals? Do they have ethics? Do they feel empathy?

We're talking about a purely hypothetical species. We haven't met them yet. None of them, if there are more than one. Right now we still don't know whether they exist.[49]
So there's nothing we can actually say about them, is there?
Actually there's one thing, one thing we can be positive about to even have in common with them, if they exist: evolution. Like us, like all lifeforms, they would have evolved. From the simplest being to what they'd presently be, via a long, long lineage of ancestors dividing into a tree of

47 War of the Worlds, 2005, written by Josh Friedman & David Koepp, based on 'The War of the Worlds' by H.G. Wells, directed by Steven Spielberg

48 Mars Attacks!, 1996, written by Jonathan Gems, based on the 1962 Topps trading card series, directed by Tim Burton

49 Brian Cox - Alien Life & The Great Filter Hypothesis (Science Time): https://www.youtube.com/watch?v=TrGpG0OrNws

diversity of species. They'd have a history. A biological history, but also a history of their society, their civilisation.

This latter stage, this societal history, wouldn't have begun as one of geniuses. You don't evolve into sentience to then suddenly, one day, have all the wisdom of the universe just appear in your brain. You learn. Slowly, by and by. You learn by means of trial and error. You'll misinterpret. Thunder is not the anger of the gods, but for a while you may think that. For a while the highest point you can climb is the highest mountain in your region, end even from there you won't see that your world is a sphere. You'll learn how to use the rocks around you to make tools, including weapons, to hunt food, to wage war. But you're a long way off from using them as pages, pages of the enormous volume of your world's biography, from which to learn about its past. You'll have no way yet of telling that everything this world contains has *not* been made for you, even though it appears to fit your needs perfectly – your kind of air to breathe, your kind of water to drink, food growing and running around – but has itself evolved through changes, and your type, the lifeforms on its skin, have played a part in it.
You'll learn about death, as evident every day in your lives, and you will not welcome it. Combined with the seemingly tailored contents of your world, but also with your inability to truly comprehend both infinity and finality, beginning with your life (you've slowly cell-divided into consciousness, so you haven't witnessed a beginning, and you can't truly comprehend pure death as the absence of experiencing, because experiencing is all you know) you'll have a fertile crop almost inevitably inviting religion.
You'll make mistakes. As individuals, and as groups, as tribes, as nations. Some of them will be very consequential, set you back, some will threaten your very existence, even the existence of life on your world as such. Some of the choices leading up to the crises emerging from those threats will be made due to nothing but your own chauvinism.

Every species that evolves into sentience will have to undergo these challenges. They'll all reach an inflection point: either adjust your attitude, change it dramatically, or perish. If there are many civilisations in our galaxy, in each galaxy, there will be those that'll make it, and those that won't. Each of them would have made mistakes. Maybe the one or other population got smart faster compared to others. They'll still have made mistakes. Bad decisions.
Here on Earth it is no coincidence that our current threats are merging. The two most major ones, the growing, intensifying, actually occurring environmental disaster, largely but not only driven by the climate catastrophe, as well as the still hypothetical, but dangerously looming threat of thermonuclear annihilation, have both been entirely created by ourselves. The perhaps most tragic aspect of this is that, as serious as they are, as absolutely urgent it is to deal with them, they should not even *be* our priorities. The cosmos is packed with existential threats to all worlds, many of which most of Earth's human population appear ignorant about.[50]
The window of life on Earth is tight. We have *at best* barely a billion years left. By which time the ever more radiant sun will have heated up to evaporate our oceans, end the carbon cycle, and thus life on Earth, and it's a process, along the way of which it'll become too hot before it reaches this point. Lifeforms we can see with our naked eyes are in total as young as about 600 million years – just over half a billion. If we're more inclusive, the world of microorganisms that has governed the planet for much longer, emerged perhaps 3.8 billion years ago. Together that's still only about half of Earth total existence from start to finish.

50 e.g. the possibility of the loss of Earth's magnetic field (2 out of the 4 inner rocky planet's have/are in the process of), gamma ray pulses of near enough exploding stars with Earth being just unlucky enough to get into the path of such a pulse, impacts of a comet or asteroid just too big to be healthy, vacuum decay (among my favourites…)… One of the most optimistic potential reasons for advanced galactic civilizations wanted to contact others could be the desire to establish a galactic network of civilizations aimed at solving such threats. The awareness about cooperation between the tribes as actually being advantageous appears to be something we're only now slowly beginning to understand, after all.

The oceans of Ganymede, Europa, Enceladus and other moons may harbour life. If so, it'll probably be microbial. But even if it's not, Ganymedean shrimp, Enceladean krill, European fish, it'll not compare to the absolutely shocking, stunning diversity of plants, animals, fungi and many other forms of life found here on Earth.
And maybe there's nothing. Just promising, dead waters.
Next chance, the next nearest star, Proxima Centauri. That's about 4.246 light years away. And we've observed that system, no conclusive bio-signals, certainly no tech-signals. Anything farther away, is *really* much, much farther away.

With this tight window in mind, with the apparent rarity of life constricted to this one little marble as far as we know at this point, and with the potential threats lurking even without our own contribution of suicidal, unnecessarily generated catastrophes, including those we might not yet know about, much of what we've learned we've only learned recently, you might think it'd give us pause. To, you know, think.

Every potential society in other star systems growing to approach a civilisation would be exposed to such challenges. Each one of them making mistakes, misjudging things, will be irresponsible once in a while.
One of the absolutely indispensable requirements for a longer-term survival of a sentient species is for this species to be history-conscious.
To be able to learn from its missteps and mistakes, to look back on its past behaviour and learn from it, adjust according to it, towards a fundamental change in attitude, away from the solipsistic, egoistical chauvinism that would otherwise *guarantee* its demise.
That is the only way to give oneself time. Time it would take to potentially figure out how to traverse between the stars. Carl Sagan wrote:

> '*The vast distances that separate the stars are providential. Beings and worlds are quarantined from one another. The quarantine is lifted only for those with sufficient self-knowledge and judgment to have safely traveled from star to star.*'[51]

Based on these principles I'd be fairly confident about the by far greater likelihood that the very appearance of an alien spaceship within the realm of our solar system would not only herald good intentions on their behalf, but very good ones indeed.
In fact, this still quite unlikely event – remember, we're not only separated by space, but likely time, civilisations may rise and vanish throughout the cosmos separated by individual intervals of thousands, millions, perhaps even billions of years, and with such small chances for contact to begin with, the fear leading to the demand not to at least try and send our own techno-signatures would potentially deprive us of even those tiny chances – this still perhaps improbable event is the one thing I'd be optimistic about.

In contrast, I can't be about the course we're currently on. Right now we're dramatically regressing, returning to an attitude marked by solipsism, tribalism and chauvinism, irrevocably leading to war and self-destruction, and the destruction of this one, sole oasis amidst an apparently lifeless desert of void, rocks and radiation, and the life on it.
If Klaatu, the one that closely resembled Michael Rennie, would come to Earth now, hold his final press conference and forward his warning that humanity would be destroyed if it decided not to change attitude and course, because other civilisations have recognized it as a threat, I'd raise my arm, 'excuse me, Mr. Klaatu, don't get this the wrong way, very glad to have you here, billion questions, but about that threat-thing, I'm afraid you could have saved yourself the trip.'[52]

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51 Carl Sagan, Pale Blue Dot: A Vision of the Human Future in Space, 1994, Random House, ISBN 0-679-43841-6

Because staying on this course, and we'll prevent ourselves from ever getting anywhere remotely closish to coming near to any proximity from where, rather when, we'd have even just the first chance of understanding how to feasibly travel to even the nearest other star, if such possibility exists.
We'll have rendered ourselves extinct long, long, *long* before that.

The necessity of becoming a non-chauvenistic true civilisation also excludes the idea of aliens taking us as pets or zoo animals. If even the dumb ape sitting at this desk already knows that what he's looking at when visiting the zoo is a prison incarcerating the innocent, driving them insane, and offering barely any education beyond what psychotic animals look like, then the members of a much more advanced civilisation will. True advancement is also an ethical one.
Our whole relationship to other terrestrial species is crucial. If we'd all learn to accept, integrate and welcome the reality of all those other beings we share the planet with being relatives, cousins of ours, then this will lead to the acceptance of our fellow human beings as sisters and brothers, no matter how far away they live, how different their cultures are, and, for goodness' sake, what colour their skin is. The latter won't be accomplished without the former.

And by all consideration, by all logic, the same goes for any other potential civilisation out there. If I was a filmmaker, or as an author, I'd find myself almost incapable of coming up with a convincing story that makes its aliens invaders.
That's not to say I don't enjoy some of those occasionally. I enjoyed the first season of 'El Eternauta' tremendously. Just know, it's the less likely type of scenario.

July 14th, 2025

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52 The Day the Earth Stood Still, 1951, written by Edmund H. North, based on the short story 'Farewell to the Master' by Harry Bates, 1940, Astounding Science Fiction, directed by Robert Wise